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Toxocara: A Public Health Danger

Toxocara

—a public



Toxocara canis

A new puppy is brought home and a few days later it is taken to the veterinarian for vaccinations and an examination. The visit includes a worm check and the diagnosis is roundworm. The owner is sent home with medication and instructions to worm the puppy twice. Roundworm is a common parasite in young puppies and most people regard it as a harmless nuisance, a puppy affliction one doesn't have to worry about.

But one should worry, insists Lawrence T. Glickman, V.M.D., Dr.P.H., Associate Professor of Epidemiology and Public Health at the School of Veterinary Medicine, University of Pennsylvania. "Roundworm larvae, when ingested by humans, can cause serious disease and, in rare instances, death. *Toxocara canis*, and, to some extent, *Toxocara cati* (cat roundworm) are a public health problem in this country and all over the world. Soil samples taken from parks and playgrounds in different areas of the United States and Canada show that one third of the sampled areas were contaminated with *Toxocara canis* eggs."

Dr. Glickman has devoted considerable time to the study of diseases caused by roundworm larvae, and with two other researchers he developed an enzyme-linked immunosorbent assay (ELISA) to detect the presence of larva infection in people. The test has been available since 1975 and it has been used here at the Veterinary School, and at the Centers for Disease Control, Atlanta, to make a definite diagnosis of visceral larva migrans (VLM) or ocular larva migrans (OLM), two diseases in humans caused by *Toxocara* larvae.

Scientists first speculated in 1921 that *Toxocara* from non-human hosts might be implicated in human disease. This notion was confirmed in the 1950s when *Toxocara* larvae were found in tissues from eyes, brains and livers of children during biopsies and autopsies. The disease was named VLM and OLM, depending on where the larvae occurred. It is not widespread but it can cause serious illness and in some cases death. Almost all the VLM cases have been reported in children between the ages of one to six years; the OLM patients tend to be children in the age group six to thirteen years.

OLM and VLM have different clinical manifestations. Both are caused by the ingestion of *Toxocara* larvae. Most of the children with VLM have a history of dirt pica (dirt eating), and they pick up the larvae when eating contaminated soil. These ingested eggs hatch in the stomach of the child and then the larvae migrate to the liver where the body attempts to fight the invaders through an immunologic reaction. At this stage the child shows signs of illness. If the larvae infestation is greater than the immune system can handle, larvae move from the liver to the lung and from there to other organs in the body. The migration is accompanied by further immune reactions and the patient may show signs of asthma, pulmonary disease or seizures, depending on where the larvae are located.

VLM can take a long time to manifest itself. Diagnosis is often difficult because the signs of the disease vary depending on the organs involved. The ELISA test is of great help to confirm the presence of *Toxocara* larvae. There are no drugs currently available which can be given to kill the larvae in human tissue. Present therapy is supportive and aimed at

controlling the inflammation caused by the larvae. The patient has to be removed from his environment to prevent the child from reinfection by eating contaminated soil. VLM is rarely fatal, though one death was reported in Philadelphia recently where an autopsy of a six-year-old child revealed massive larvae infestation in the brain.

Ocular larva migrans (OLM) is a *Toxocara* infestation confined to the eye. OLM patients rarely exhibit the signs of VLM, and there have been only a few cases reported where a patient had both OLM and VLM. In the eye the larvae can cause severe problems, even blindness. In the past, OLM patients were often diagnosed as having retinoblastoma and the eye was removed because OLM resembles that tumor.

Now with the ELISA test physicians can make a definite diagnosis of OLM and attempt to save the eye. Patients are treated with anti-inflammatory drugs to reduce the ocular in-

flammation but the larvae cannot be removed. They may become dormant only to begin the disease process at some later time when migration occurs.

Dr. Glickman thinks that OLM patients probably had such small numbers of *Toxocara* larvae that the immune response of the liver and other tissues was not sufficiently stimulated and the larvae could migrate randomly through the body. "It's pure chance that they eventually wind up in the eye," he said. "More research is needed to determine at which levels *Toxocara* larvae activate the immune system." OLM patients usually do not have a history of dirt pica and they tend to come from a higher socio-economic group than VLM patients. Many parents of young OLM patients are not aware that their child has the disease and often these children are identified during routine check-ups at schools or by the pediatrician.

Dogs and cats are all around us, they live as pets in homes or as strays in streets and parks. Thus, even with tough dog laws, it is very difficult to eliminate *Toxocara* eggs and larvae from playgrounds and backyards. There is, however, something which can be done, according to Dr. Glickman. "The key to reducing the prevalence of *Toxocara* larvae in the ground is by preventing roundworms to mature in puppies."

More than 90 percent of all puppies are born with the parasite and these worms are the primary source of eggs and larvae. Roundworms have evolved a complex life cycle which permits intermediate hosts and which makes eradication of the worm almost impossible.

Adult dogs and bitches carry roundworm larvae in their tissues, but they do not nor-

health danger

mally cause the reaction seen in humans. When a bitch is pregnant, after the forty-second day of gestation, these larvae migrate to the fetus where they settle in the liver. Once a puppy is born, the larvae migrate to the lung and from there into the trachea where they are swallowed. They develop into adults in the small intestine.

By the time a puppy is three weeks old it has adult roundworms which are capable of laying eggs. These worms can live up to six months and a female can produce up to 200,000 eggs a day. Puppies may receive additional larvae from the bitch while nursing, through transmammary migration. This influx reaches its peak at the second week of the puppy's life and ends about thirty-two days after birth. These larvae will also mature into reproductive adult roundworms.

Roundworm eggs are not infective until they have embryonated. This process takes between two to five weeks. Embryonated eggs, when ingested by humans or animals, hatch larvae. It was found that unembryonated eggs can survive for years if conditions are favorable. So far no agent, other than extreme heat, has been found to destroy the eggs. They can remain in the soil and embryonate later when environmental conditions are favorable.

By the time a puppy is five weeks old it has begun to develop an immunity toward roundworm. Most of the ingested larvae no longer develop into worms but instead migrate to tissues to resume migration if the host is female and becomes pregnant. Then the cycle begins anew. It has been shown that adult dogs, other than lactating bitches, rarely have roundworm infestations.

Common practice is to worm puppies at six and eight weeks of age. However, by then a puppy has shed millions of eggs. Dr. Glickman advocates worming puppies and nursing bitches for the first time when the litter is two

weeks old. There should be subsequent wormings at four, six, and eight weeks. This practice eliminates most of the adult roundworms in puppies and greatly reduces the shedding of eggs.

Dr. Schantz and his colleagues at the Centers for Disease Control conducted a random survey of 100 veterinarians to find out what worming routines were recommended to clients. They found that only 7 percent of the veterinarians surveyed recommended the worming of puppies at less than three weeks of age; 34 percent recommended worming by the fourth week, and the balance of the sample recommended worming between six and eight weeks. It was also discovered that 77 percent of the veterinarians would not treat for roundworm without a fecal sample; only 23 percent routinely wormed puppies without a sample.

"The veterinarians can have an important role in eliminating this public health hazard by routinely recommending to their clients that the puppies and the bitch are wormed at two, four, six, and eight weeks," Dr. Glickman said. "The veterinarian has to educate his clients and explain the hazards of *Toxocara* infection and the importance of keeping the whelping area and the yard cleaned up to prevent eggs from settling into the soil."

Dr. Glickman goes a step further. He advocates that each puppy which is placed in a new home be accompanied by a certificate stating that it has been wormed and is free of the parasite. He feels that this should be law and should apply to all puppies, whether they come from a private breeder, a pet shop, or an animal shelter. He also advocates strict enforcement of leash laws and greater efforts to eliminate the stray dog population. Such preventive measures, together with early worming of all puppies, would decrease the incidence of OLM and VLM in children and reduce the stigma of dogs as a public health hazard.

We're getting older, bigger, and better! As the School nears 100 years, a very special Penn Annual Conference is planned for January 25 and 26, 1984, at the Franklin Plaza Hotel in Center City Philadelphia—and if the 1983 Penn Annual Conference is an indication, we can expect a turn-out large enough to warm the whole month of January.

The 1983 Conference held at the Philadelphia Hilton attracted 800 participants including: 450 practitioners, 100 speakers and faculty, 100 students, and 60 scientific exhibits staffed by 120 representatives.

Small Animal topics covered a variety of medical and surgical problems such as: bleeding and skin disorders, epilepsy, parasitology, anesthesia, radiology, hormone imbalances, and human/animal interactions. Dr. Bradford Smith, from the University of California School of Veterinary Medicine, spoke on equine salmonellosis, liver diseases, and pneumonia in foals. Other large animal topics included bovine orthopaedic problems, bovine medicine, calf diarrhea, equine botulism, radiology, and ophthalmology.

The Robert S. Brodey Memorial Lecture was presented by Dr. William Hardy, Head of the Laboratory of Veterinary Oncology at the Memorial Sloan-Kettering Cancer Center in New York. Dr. Hardy lectured before an audience of over 300 on Retroviruses and Animal Cancer Genes.

During intermissions and lunch, senior veterinary students had time to meet future employers. Sixty practitioners (37 Small Animal, 21 Mixed Practice, 2 Large Animal) requested interviews with students to fill positions in their practice. The students supervised the interview schedule from a private interview room. The School is proud to be able to help its students and area practitioners find mutually beneficial employment opportunities via the Penn Annual Conference.

Another important function of the Penn Annual Conference is to allow students, faculty, practitioners, and staff to meet and mingle in an informal atmosphere. On Wednesday evening, January 26, the Dean hosted a reception and buffet where conversation ranged from sports, finances, and auto repairs to complex medical and surgical problems.

Twenty auto-tutorial programs were available in a private screening room for those who wanted a break from the lecture format. Video and slide programs on Orthopaedic and Soft Tissue Surgery, Exotic Animals, Rabies, Lameness, Conformation, Gait, Biopsy Techniques and Chest Tube Placement were popular items with practitioners.

The Penn Annual Conference offers ten hours of continuing education credit, thus fulfilling the requirement for relicensure in Pennsylvania.

Toxocara cati

